REMARKS

Claims 1, 5, and 6 are pending in the present Application. No claims have been canceled, amended, or added, leaving Claims 1, 5, and 6 for consideration upon entry of the present Amendment.

Interview Summary

An Examiner interview was held on March 16, 2011 with the Examiner (Conley) in the above-identified application, and Applicant's agent (Gronbeck). At the Examiner's request, Applicants' agent summarized the inventive features of the instant invention as being a separator for a battery having a patterned layer formed of a gel-type polymer on the surfaces of the separator, and where the advantage to a gel polymer pattern is that the use of the gel polymer in contact with cathode/anode materials in a battery structure, allows for the interpenetration of electrolyte into the gel polymer and hence allows contact of the electrolyte with the underlying active material. In contrast, a solid (non-gel) polymer does not allow for interpenetration of an electrolyte into the polymer, and for this reason the active material underlying a solid polymer is not accessible to the electrolyte leading to non-uniform interaction of the electrolyte and the active materials underlying the pattern.

The Examiner indicated that, based on the above advantages, the separator should require the presence of an electrolyte. However, claim 1 claims the separator itself, having the gel pattern, and Applicants maintained that the separator having the pattern is not disclosed by the cited art (Yoshida, EP 0982790). Because the coated separator subcomponent of the battery is a product in itself, Applicants maintained it is not necessary to include an electrolyte with the separator with the gel polymer pattern.

The Examiner indicated that Yoshida does not distinguish between gel polymers and non-gel polymers. Applicant's agent cited passages in Yoshida, which state that the polymer is a *solid* polymer (Yoshida, [0024], last sentence), that it is "advantageous" that "drying is not necessary" (i.e., that the solid polymer adhesive is not dissolved or suspended in a solvent) in order to join the separator and active material (Yoshida, [0031]), and that adhesion is carried out by plastic deformation of the adhesive resin by heating, which can allow infiltration of the solid polymer adhesive resin into the active material so that where a temperature excursion occurs, the adhesive resin helps shut down current flow (Yoshida, [0039]-[0041]). The Examiner replied

that heating the gel polymer would result in the same effect as in Yoshida, and that the gel polymer would become a solid polymer upon heating; however, Applicant's agent argued that Yoshida nonetheless fails to teach a gel polymer, and that Claim 1 does not require heating the gel polymer to either coat the gel polymer or to form the separator (or battery structure).

The Examiner then focused discussion on the gel polymer, and indicated that the specification must define "gel polymer" to distinguish it from a polymer which merely does not include a solvent (which supported the Examiner's initial proposal that the separator must also include an electrolyte). Applicant's agent identified the definition of gel polymer found in the specification on p. 7, lines 17-19, which states that "[a] gel-polymer means *a polymer absorbing a liquid electrolyte spontaneously* and thus *becoming* gelled and swollen, *when* it is contacted with the electrolyte." This definition means that the gel polymer need only be a polymer that is capable of swelling when it comes in contact with a solvent, but need not actually include the solvent (e.g., electrolyte) to have this property.

The Examiner indicated that a response, which so defines gel polymer over Yoshida (specifically, [0024] and [0031]) may be persuasive in overcoming Yoshida. Applicant's agent then requested the Examiner consider the combination of Yoshida with the secondary reference Murai (JP 10-289732) to complete the discussion.

Applicant's agent indicated that Applicants understood Murai to have been introduced to supply the teaching of PVdF as a gel-type polymer. However, Yoshida teaches a solid polymer (Yoshida, [0024]) and provides a teaching away from the use of a gel polymer where it is advantageous that drying is not needed as Yoshida uses a solid hot-melt type adhesive (Yoshida, [0031]). Applicant's agent further noted that while Murai teaches PVdF gel polymer (Murai, [0008]), Murai clearly discloses that it is disadvantageous to use gel polymers in general because "adhesive strength ... fails [at] an elevated temperature" and hence Murai teaches away from using gel polymers. The materials disclosed to be of use in Murai are disclosed in [0010] and [0011], and based on the teaching away from the use of gel polymers, such materials must therefore not be gel polymers.

Therefore it was argued that there is no suggestion to combine Yoshida and Murai to provide all elements of the instant claims. The Examiner did not disagree with this reasoning, and agreed to reconsider the rejection based on a response which includes this reasoning, and without requiring further amendment. The Examiner made clear that additional search would be

performed, and that it is possible that additional grounds of rejection may be identified and that therefore, no final agreement was reached at that time as to the claims.

Applicants wish to sincerely thank the Examiner for the courtesy shown Applicant's agent in holding the interview.

Reconsideration and allowance of the claims are therefore respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 103(a)

Claims 1, 5, and 6 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over European Patent No. 0 9982 790 ("Yoshida") in view of Japanese Patent Publication 10-289732 (Murai).

Applicants respectfully traverse these rejections.

Yoshida discloses a separator 4 having an adhesive resin 6 partially coated on a separator 4 for joining electrodes 3 and 5 to the separator, where the adhesive resin 6 includes an at least partially plastic resin. Yoshida, Abstract, FIG. 1, [0024]. The adhesive (plastic) resin is at least partially in a dotted, striped, or checked pattern to join the active material layers 32 and 52 to separator 4. Yoshida, [0024]. The adhesive resin is not particularly limited as long as it is "[a]ny adhesive resin that does not dissolve in an electrolytic solution," and may include polyolefins, polyglycols, and silicon resins. Yoshida, [0026]. The plastic resin is a resin which is solid and self-adhesive at ambient temperature and deforms on heat or pressure application. Yoshida, [0024], last sentence.

The distance between each active material layer (i.e., layers 3 and 5) and the separator is 30 micrometers or smaller. Yoshida, [0020]. The total area of the voids 7 interspersed between the adhesive is 30 to 90%. Yoshida, [0027]. Yoshida discloses disposing a molten resin (6) by using a coater, in which a molten resin is picked up with a rotating roll having depressions and transferring them to a sheet (i.e., a separator) and while Yoshida states that the method of applying is not particularly limited, the only alternative method discussed is that of spray coating and roll coating by extruding molten resins through holes of a roll. Yoshida, [0029], specifically at Col. 6, line 59 to Col. 7, line 8.

Murai teaches PVdF as a gel polymer. Murai, [0008]. Murai further discloses that it is disadvantageous to use gel polymers in general because "adhesive strength ... fails [at] an

elevated temperature." Murai, [0008]. Murai discloses use of adhesives which include "at least one kind of organic vinyl compound which contains two or more vinyl groups in one molecule." Murai, [0010]. The organic vinyl compound includes acrylic ester, polyacrylic ester, methacrylic ester, or polymethacrylic ester. Murai, [0011].

"A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR Int'l Co. v. Teleflex Inc.,* 127 S.Ct. 1727, 1741 (2007). To find obviousness, the Examiner must "identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does." *Id.*

The combination of Yoshida and Murai fail to provide a suggestion or incentive that would lead one skilled in the art to combine these reference and modify the combination to provide all elements of the instant claims.

Claims 1 and 5each claim *inter alia* a separator having a pattern of a gel polymer thereon, where the "gel polymer is selected from the group consisting of polyvinylidene fluoride (PVDF); polyethylene glycol diacrylate; polyalkylene glycol diacrylates; polyalkylene glycol dimethacrylates; ether polymers; carbonate polymers; acrylonitrile polymers; copolymers and crosslinked polymers consisting of at least two of them; and fluoropolymers." A gel polymer is further defined in the instant Specification on p. 7, lines 17-19, where it states that "[a] gel-polymer means *a polymer absorbing a liquid electrolyte spontaneously* and thus *becoming* gelled and swollen, *when* it is contacted with the electrolyte." So defined, the gel polymer of the instant claims is a polymer that is capable of swelling when it comes in contact with a solvent, but need not include the solvent (e.g., electrolyte) to have this property.

Yoshida teaches a solid polymer (Yoshida, [0024]) and teaches that use of a solid polymer (i.e., a melt adhesive as disclosed in each of the Examples of Yoshida) is advantageous that drying is not needed. Yoshida, [0031]. Yoshida is silent as to the gel polymers claimed in Claims 1 and 5. We further noted that while Murai teaches PVdF gel polymer (Murai, [0008]), Murai discloses that it is disadvantageous to use gel polymers in general because "adhesive strength … fails [at] an elevated temperature" and hence Murai also teaches away from using gel polymers. The materials disclosed to be of use in Murai and which include at least two vinyl groups as disclosed in [0010] and [0011] are therefore by the requirements of Murai *not* gel polymers, whereas those polymers claimed in instant Claims 1 and 5 are gel polymers. Murai

therefore fails to remedy the deficiencies of Yoshida, and the combination fails to teach the gel polymers as instantly claimed.

Applicants respectfully submit that the Examiner, in arriving at this specific construction, has destroyed the intent of the references. In this regard, the courts have held that "[i]f the proposed modification would render the prior art invention being modified unsatisfactorily for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon* 733 F. 2d 900, 221 USPQ 1125 (Fed. Cir. 1984). The courts have also held that '[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious.'" *In re Ratti* 270 F. 2d 810, 123 USPQ 349 (CCPA 1959). To modify Yoshida with PVdF gel polymer disclosed in the background of Murai which teaches away from gel polymers in general and PVdF in particular, in order to meet the limitations of instant Claims 1 and 5, would both render Yoshida and Murai each unsatisfactory for their intended uses of limited swelling and melt adhesion. Yoshida states [0024] that the plastic resin is solid and deforms on heating or pressure, and Murai states that the adhesive strength (of a gel polymer) fails at elevated temperature and hence that such polymers are unsuitable adhesives. The skilled artisan will appreciate that the solvent resistance required by the resin of Yoshida, in combination with the statement that the resin is solid and only thermally deformable (consistent with methods of adhering the separator to the electrodes in Yoshida) indicates that a resin deformable by solvent swelling is not desired, and therefore there is a further disincentive to modifying Yoshida with Murai as to do so would render Yoshida unsuited to its intended purpose of providing a solvent-resistant adhesive for binding the electrodes to the separator. Note that the instant Claims 1 and 5 require a gel polymer; however, the adhesive in Yoshida and Murai each has different requirements which preclude swelling. For these reasons at least, there is no suggestion or incentive to modify Yoshida with Murai as to do so would require modifying each in a way not taught in the respective specifications, and so these references provide no expectation of success for the combination.

As noted previously, the separator claimed in instant Claims 1 and 5 has a gel polymer-coated part and a non-coated part in a regular patterned shape and the regularly formed gel polymer pattern is uniform and relatively thin (e.g., 1-2 μm). The electrode contacting and underlying the gel polymer pattern may, because of the permeability of the gel polymer, be

uniformly impregnated with the electrolyte and thus the electrode is uniformly wetted with the electrolyte.

Therefore, uniform battery performance can be obtained and the battery life can be improved and also electrode reactions can be performed uniformly, thereby preventing lithium precipitation and improving battery safety (*see* paragraph [0061] of the instant Specification published as U.S. Patent Application Publication No. 2007/0054183). These advantageous features obtained by the claimed invention are not taught or suggested in Yoshida and Murai.

For these reasons at least, neither Yoshida nor Murai provide a suggestion or incentive that would lead one skilled in the art to modify Yoshida and Murai to provide a thermoplastic that includes the claimed gel polymers claimed in Claims 1 and 5.

Therefore, the combination of Yoshida and Murai fails to render Claims 1, 5, and 6 unpatentable. Reconsideration and allowance are respectfully requested.

Conclusion

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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